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10CS/IS661

Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015

**Operations Research**

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer FIVE full questions, selecting at least TWO questions from each part.

**PART – A**

- 1 a. What is operations research? Briefly explain the various phases of operations research study. (08 Marks)
- b. A person requires minimum 10, 12 and 12 units of chemicals for A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per jar. A dry product contains 1, 2 and 4 units of A, B and C per jar. If the liquid product sells for Rs.3 per jar and dry product sells for Rs.2 per jar, how many of each should be purchased in order to minimize the cost and meet requirement. (06 Marks)
- c. Use graphical method to solve the following :
- $$\text{Max } z = 100x_1 + 40x_2$$
- $$\text{Subjected to } 5x_1 + 2x_2 \leq 1000$$
- $$3x_1 + 2x_2 \leq 900$$
- $$x_1 + 2x_2 \leq 500$$
- $$x_1, x_2 \geq 0$$
- (06 Marks)
- 2 a. Solve the following LPP by using simplex method
- $$\text{Max } z = 3x_1 + 2x_2 + 5x_3$$
- $$\text{Subjected to } x_1 + 2x_2 + x_3 \leq 430$$
- $$3x_1 + 2x_2 \leq 460$$
- $$x_1 + 4x_2 \leq 420$$
- $$x_1, x_2, x_3 \geq 0$$
- (10 Marks)
- b. Explain the steps involved in setting up of a simplex method. (10 Marks)
- 3 a. Solve the following LPP by using Big M method:
- $$\text{Max } z = -2x_1 - x_2$$
- $$\text{Subjected to } 3x_1 + x_2 = 3$$
- $$4x_1 + 3x_2 \geq 6$$
- $$x_1 + 2x_2 \leq 4$$
- $$x_1, x_2 \geq 0$$
- (10 Marks)
- b. Solve the following LPP by using two-phase method:
- $$\text{Max } z = 5x_1 + 8x_2$$
- $$\text{Subjected to } 3x_1 + 2x_2 \geq 3$$
- $$x_1 + 4x_2 \geq 4$$
- $$x_1 + x_2 \leq 5$$
- $$x_1, x_2 \geq 0$$
- (10 Marks)

10CS/IS661

- 4 a. Explain the steps involved in revised simplex method.  
 b. Use revised simplex method to solve the following LPP:

$$\begin{aligned} \text{Min } z &= x_1 + x_2 \\ \text{Subjected to } x_1 + 2x_2 &\geq 7 \\ 4x_1 + x_2 &\geq 6 \\ x_1, x_2 &\geq 0 \end{aligned}$$

(10 Marks)

**PART – B**

- 5 a. Explain the role of duality theory in sensitivity analysis.  
 b. Write the dual of the following LPP:

i)  $\text{Max } z = 3x_1 - x_2 + x_3$   
 Subjected to  $4x_1 - x_2 \leq 8$   
 $8x_1 + x_2 + 3x_3 \geq 12$   
 $5x_1 - 6x_3 \leq 13$   
 $x_1, x_2, x_3 \geq 0$

ii)  $\text{Min } z = 2x_2 + 8x_3$   
 Subjected to  $3x_1 + x_2 \geq 12$   
 $2x_1 + x_2 + 6x_3 \leq 6$   
 $5x_1 - x_2 + 3x_3 = 4$   
 $x_1, x_2, x_3 \geq 0$

(10 Marks)

- 6 a. Find the initial solution to the following transportation problem using VAM:

		Destination				Supply
		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
Factory	F <sub>1</sub>	3	3	4	1	100
	F <sub>2</sub>	4	2	4	2	125
	F <sub>3</sub>	1	5	3	2	75
Demand		120	80	75	25	300

(10 Marks)

- b. Explain Hungarian algorithm with example. (10 Marks)
- 7 a. Define the following with respect to games:  
 i) Pay off                      ii) Strategy                      iii) Saddle point. (03 Marks)
- b. Solve the following game by graphical method: (07 Marks)

Player B

Player A  $\begin{bmatrix} 3 & -3 & 4 \\ -1 & 1 & -3 \end{bmatrix}$

(07 Marks)

- c. Solve the following game by dominance property:

Player B

Player A  $\begin{bmatrix} 2 & -2 & 4 & 1 \\ 6 & 1 & 12 & 3 \\ -3 & 2 & 0 & 6 \\ 2 & -3 & 7 & 7 \end{bmatrix}$

(10 Marks)

- 8 Write short notes on:  
 a. Genetic algorithm.  
 b. Metaheuristics.  
 c. Tabu search algorithm.  
 d. Simulated annealing algorithm. (20 Marks)

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